

REMARKS

The rejections under 35 U.S.C. § 103(a) of Claims 1-4, 6-12 and 15-21 as unpatentable over US 5,012,008 (Drago et al) in view of US 3,992,453 (Massie), and of Claims 5 and 13 as unpatentable over Drago et al and Massie, and further in view of WO 87/07261 (Maher et al), are respectfully traversed.

The present invention is drawn to a process for the catalytic hydroformylation of an olefinically unsaturated compound having from 3 to 24 carbon atoms, using an unmodified catalyst comprising rhodium (Claim 1 and claims dependent thereon), or an unmodified catalyst comprising at least one metal of groups 8-10 of the periodic table of the elements except cobalt (Claim 21), wherein the hydroformylation is carried out in the presence of a particular cyclic carbonic ester, which ester is present in an amount of at least 1% by weight of the reaction mixture.

Applicants, being entitled to be their own lexicographer, define the term “unmodified” to mean that modified ligands which contain one or more donor atoms of group 15 of the periodic table of the elements, such as phosphorus, is excluded, although other modifying ligands are not, as described in the specification at page 2, line 5ff.

As described in the specification herein at page 30, lines 11-22, data disclosed for the present invention show that by using the recited amount of cyclic carbonate ester, rhodium precipitation can be prevented. In addition, the process of the present invention shows significantly higher chemoselectivity and allows simple recirculation of the catalyst without deactivation. See the specification at page 30, lines 24-28.

Drago et al discloses a supported amorphous phase heterogeneous catalyst (SAPC) for biphasic hydroformylation of olefins. Drago et al discloses that such catalysts are known materials and are characterized as comprising a complex containing a Group VIII metal complex dispersed in a non-volatile film containing dissolved triphenylphosphine which is

supported on a porous solid support, wherein the amorphous (non-crystalline) phase can be a non-volatile liquid or amorphous (preferably rubbery) polymer which forms a coating on the solid support that prevents loss of said coating to the vapor or liquid phase reactant (column 3, lines 20-29). Drago et al's invention is the discovery of the use of such catalysts for hydroformylation. Drago et al discloses further that their SAPC catalyst also contains a biphylllic ligand, which are preferably phosphines (column 6, line 8ff). Among applicable non-volatile amorphous film materials, Drago et al lists propylene carbonate (column 6, line 49ff, especially lines 55-56). Drago et al discloses further that the amount of nonvolatile liquid film is about 1-30 wt.% based on the weight of the carrier or support material (column 7, lines 33-35). Of the 19 examples disclosed by Drago et al, only Examples 1, 5 and 10 employ propylene carbonate, and in an amount of 0.08 gm, which as a percentage of the reaction mixture in these examples, is considerably less than 1%. Indeed, less than 0.3 % of propylene carbonate is used.

Massie is drawn to a hydroformylation process carried out in the presence of a cobalt-containing compound catalyst and an ester of carbonic acid disclosed as a promoter. No particular amount range is disclosed for the promoter. However, in the Examples, the percentage of promoter is less than the presently-recited minimum of 1%. Note that Massie discloses that their hydroformylation may be effected in inert organic media, and lists exemplary compounds which are all hydrocarbons, i.e., cyclic carbonates are not included (column 5, lines 7-12).

Maher et al is drawn to the use of an organic polymer additive to minimize or prevent the rhodium of a rhodium-organophosphite complex catalyst from precipitating from solution during a liquid recycle hydroformylation process (Abstract).

Without the present disclosure as a guide, one skilled in the art would not have combined Drago et al and Massie, or Drago et al, Massie and Maher et al, but even if

combined, the result would not be the presently-claimed invention. None of the applied prior art discloses or suggests a cyclic carbonate within the terms of the present claims to be present in an amount of at least 1% by weight of a reaction mixture. Moreover, if one skilled in the art were to combine Drago et al and Massie, the result would be the use of a cobalt-containing catalyst, which is excluded by the present claims. Maher et al is irrelevant, since it is directed to **modified catalysts** comprising rhodium, which catalysts are excluded by the present claims.

The Examiner finds that Massie discloses a percentage range for their promoter of at least 15[%] by weight, relying on the disclosure at column 4, line 34 to column 7, line 28.

In reply, there is no such disclosure *per se* nor do the Examples support such a finding. For example, Example I discloses 143.0 millimoles of decene-5, 1.0 millimole of dicobalt octacarbonyl, 4.0 millimoles of diethyl carbonate, and 5 milliliters of n-pentane. It is clear that the 4.0 millimoles of diethyl carbonate is substantially less than 1% by weight of the reaction mixture. Similar results are obtained for the remaining examples.

The Examiner finds that one of ordinary skill in the art would have found it obvious to employ “any amount of solvent....” In reply, none of the applied prior art discloses a cyclic carbonate as a solvent in a hydroformylation reaction.

Finally, while the above is sufficient to demonstrate patentability over the applied prior art, the newly-submitted Kaizik Declaration provides further evidence of the superiority of rhodium compared to cobalt when used in combination with the other limitations of the present claims, such as when hydroformylation is carried out in the presence of the cyclic carbonate of formula I. The Kaizik Declaration describes a new comparative example, i.e., Example 4, which should be compared to Example 2 in the specification, which uses rhodium and is according to the present invention. The data show that, *inter alia*, compared to rhodium, significantly higher amounts of cobalt must be used for a comparable activity,

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work-up of cobalt is more difficult, hydroformylation is slower, and selectivity is poorer.

Clearly, there is no suggestion in the prior art of the superiority of rhodium to cobalt.

For all the above reasons, it is respectfully requested that the rejections over prior art be withdrawn.

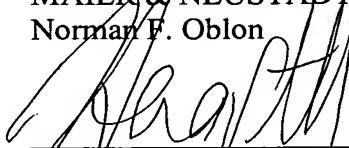
All of the presently-pending claims in this application are now believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

Respectfully submitted,

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